

Claims

What is claimed is:

1. A method of selecting a gear in an automated manual transmission, the transmission including an actuation mechanism for actuating at least one shift rod, the shift rod adapted to engage a shift collar with a selected gear, the method including the steps of:

(a) moving the shift rod into a neutral position;

(b) engaging the actuation mechanism to produce an initial engagement force on the shift rod, thereby moving the shift rod and collar towards the selected gear; and

(c) adjusting the rotational speeds of the collar and selected gear until they reach a predetermined rotational speed differential;

wherein the method further includes the steps of:

(d) modulating the initial engagement force during the speed adjustment step (c); and

(e) applying a final engagement force to the shift rod following the modulation step, so as to effect the full engagement of the selected gear.

2. The method of Claim 1, wherein the modulation step (d) includes reducing the initial engagement force to an intermediate engagement force smaller than the initial engagement force during the speed adjustment step (c).

3. The method of Claim 2, wherein the modulation step (d) further includes increasing the intermediate engagement force towards the final

engagement force over a predetermined period of time during the speed adjustment step.

4. The method of Claim 1, wherein the transmission further includes a clutch, and the method further includes the initial step of disengaging the clutch prior to moving the shift rod into the neutral position.

5. The method of Claim 4, wherein the method further includes the step of engaging the clutch once the selected gear is fully engaged.

6. The method of Claim 1, wherein the transmission further includes at least one position determining sensor adapted to monitor the position of the at least one shift rod, and wherein the method further includes the steps of:

(f) determining that the shift rod is in a neutral position; and

(g) determining that the shift rod is in a gear engagement position following the application of the final engagement force.

7. The method of Claim 6, further including the step of monitoring the shift rod position when the shift rod is in the gear engagement position.

8. The method of Claim 7, further including the step of moving the shift rod to a neutral position following the application of the final engagement force should the position of the shift rod move outside a predetermined limit when in the gear engagement position.

9. A method of selecting a gear in an automated manual transmission, the transmission including an actuation mechanism for actuating at least one shift fork, the shift fork adapted to engage a shift collar with a selected gear, the method including the steps of:

- (a) moving the shift fork into a neutral position;
  - (b) engaging the actuation mechanism to produce an initial engagement force on the shift fork, thereby moving the shift fork and collar towards the selected gear; and
  - (c) adjusting the rotational speeds of the collar and selected gear until they reach a predetermined rotational speed differential;
- wherein the method further includes the steps of:
- (d) modulating the initial engagement force during the speed adjustment step (c); and
  - (e) applying a final engagement force to the shift fork following the modulation step, so as to effect the full engagement of the selected gear.

10. The method of Claim 10 wherein said shift fork is engaged with a shift rod that is actuated by the actuating mechanism.

11. The method of Claim 9, wherein the modulation step (d) includes reducing the initial engagement force to an intermediate engagement force smaller than the initial engagement force during the speed adjustment step (c).

12. The method of Claim 11, wherein the modulation step (d) further includes increasing the intermediate engagement force towards the final engagement force over a predetermined period of time during the speed adjustment step.

13. The method of Claim 9, wherein the transmission further includes a clutch, and the method further includes the initial step of disengaging the clutch prior to moving the shift fork into the neutral position.

14. The method of Claim 13, wherein the method further includes the step of engaging the clutch once the selected gear is fully engaged.

15. The method of Claim 9, wherein the transmission further includes at least one position determining sensor adapted to monitor the position of the at least one shift fork, and wherein the method further includes the steps of:

- (f) determining that the shift fork is in a neutral position; and
- (g) determining that the shift fork is in a gear engagement position following the application of the final engagement force.

16. The method of Claim 15, further including the step of monitoring the shift fork position when the shift rod is in the gear engagement position.

17. The method of Claim 16, further including the step of moving the shift fork to a neutral position following the application of the final engagement force should the position of the shift fork move outside a predetermined limit when in the gear engagement position.

18. A method of selecting a gear in an automated manual transmission, the transmission including an actuation mechanism for actuating at least one shift collar engageable with a selected gear, the method including the steps of:

- (a) moving the shift collar into a neutral position;
- (b) engaging the actuation mechanism to produce an initial engagement force on the shift collar, thereby moving the shift collar towards the selected gear; and

(c) adjusting the rotational speeds of the collar and selected gear until they reach a predetermined rotational speed differential;

wherein the method further includes the steps of:

(d) modulating the initial engagement force during the speed adjustment step (c); and

(e) applying a final engagement force to the shift collar following the modulation step, so as to effect the full engagement of the selected gear.

19. The method of Claim 18 wherein said shift collar is engaged with a shift fork that is actuated by the actuating mechanism

20. The method of Claim 19 wherein said shift fork is engaged with a shift rod that is actuated by the actuating mechanism.

21. The method of Claim 18, wherein the modulation step (d) includes reducing the initial engagement force to an intermediate engagement force smaller than the initial engagement force during the speed adjustment step (c).

22. The method of Claim 21, wherein the modulation step (d) further includes increasing the intermediate engagement force towards the final engagement force over a predetermined period of time during the speed adjustment step.

23. The method of Claim 18, wherein the transmission further includes a clutch, and the method further includes the initial step of disengaging the clutch prior to moving the shift collar into the neutral position.

24. The method of Claim 23, wherein the method further includes the step of engaging the clutch once the selected gear is fully engaged.

25. The method of Claim 18, wherein the transmission further includes at least one position determining sensor adapted to monitor the position of the at least one shift collar, and wherein the method further includes the steps of:

- (f) determining that the shift collar is in a neutral position; and
- (g) determining that the shift collar is in a gear engagement position following the application of the final engagement force.

26. The method of Claim 25, further including the step of monitoring the shift collar position when the shift rod is in the gear engagement position.

27. The method of Claim 26, further including the step of moving the shift collar to a neutral position following the application of the final engagement force should the position of the shift collar move outside a predetermined limit when in the gear engagement position.

28. An automated manual transmission including:  
a plurality of gears;  
at least one shift rod adapted to engage a shift collar with at least one of the plurality of gears;  
an actuation mechanism for actuating the at least one shift rod;  
at least one synchronizer for adjusting the rotational speed differential between the shift collar and the at least one gear; and  
a control system which engages the actuation mechanism so as to apply an initial engagement force to the shift rod such that the shift rod and collar move towards the at least one gear;

wherein the control system is adapted to modulate the initial engagement force when the synchronizer is adjusting the rotational speed differential between the shift collar and the at least one gear, and to apply a final engagement force to the shift rod following the modulation of the initial engagement force.

29. The transmission of Claim 14, further including at least one position determining sensor adapted to monitor the position of the at least one shift rod.

30. The transmission of Claim 14, wherein the at least one shift rod has a biased mechanical detent adapted to hold the shift rod in one of a number of neutral or gear engagement positions.

31. The transmission of Claim 14, wherein the actuation mechanism is a hydraulic actuation mechanism including a hydraulic fluid circuit and a control valve located in the hydraulic fluid circuit, the control valve being adapted to modulate the hydraulic pressure in the hydraulic fluid circuit in response to commands from the control system.

32. An automated manual transmission, including:

- a plurality of gears;
- at least one shift fork adapted to engage a shift collar with at least one of the plurality of gears;
- an actuation mechanism for actuating the at least one shift fork;
- at least one synchronizer for adjusting the rotational speed differential between the shift collar and the at least one gear; and

a control system which engages the actuation mechanism so as to apply an initial engagement force to the shift fork such that the shift fork and collar move towards the at least one gear;

wherein the control system is adapted to modulate the initial engagement force when the synchronizer is adjusting the rotational speed differential between the shift collar and the at least one gear, and to apply a final engagement force to the shift fork following the modulation of the initial engagement force.

33. The method of Claim 32 wherein said shift fork is engaged with a shift rod that is actuated by the actuating mechanism.

34. The transmission of Claim 32, further including at least one position determining sensor adapted to monitor the position of the at least one shift fork.

35. The transmission of Claim 32, further including a biased mechanical detent adapted to hold the shift fork in one of a number of neutral or gear engagement positions.

36. The transmission of Claim 32, wherein the actuation mechanism is a hydraulic actuation mechanism including a hydraulic fluid circuit and a control valve located in the hydraulic fluid circuit, the control valve being adapted to modulate the hydraulic pressure in the hydraulic fluid circuit in response to commands from the control system.

37. An automated manual transmission, including:  
a plurality of gears;  
at least one shift collar engageable with at least one of the plurality of gears;

an actuation mechanism for actuating the at least one shift collar;  
at least one synchronizer for adjusting the rotational speed differential between the shift collar and the at least one gear; and  
a control system which engages the actuation mechanism so as to apply an initial engagement force to the shift collar such that the shift collar moves towards the at least one gear;  
wherein the control system is adapted to modulate the initial engagement force when the synchronizer is adjusting the rotational speed differential between the shift collar and the at least one gear, and to apply a final engagement force to the shift collar following the modulation of the initial engagement force.

38. The method of Claim 37 wherein said shift collar is engaged with a shift fork that is actuated by the actuating mechanism.

39. The method of Claim 38 wherein said shift fork is engaged with a shift rod that is actuated by the actuating mechanism.

40. The transmission of Claim 37, further including at least one position determining sensor adapted to monitor the position of the at least one shift collar.

41. The transmission of Claim 37, further including a biased mechanical detent adapted to hold the shift collar in one of a number of neutral or gear engagement positions.

42. The transmission of Claim 37, wherein the actuation mechanism is a hydraulic actuation mechanism including a hydraulic fluid circuit and a control valve located in the hydraulic fluid circuit, the control valve being

adapted to modulate the hydraulic pressure in the hydraulic fluid circuit in response to commands from the control system.